

THE ROLE OF AEROSPACE TECHNOLOGIES AND THE MILITARY FACTOR FOR NATIONAL SECURITY

Petar Getsov, Pavel Penev***

** Director of the Space Research Institute-Bulgarian Academy of Sciences
** Military Academy "G.S.Rakovski"*

Abstract

In the paper, the current state of using aerospace data in the Bulgarian Army is discussed. The potential application areas of aerospace images in military affairs are outlined. Peacetime, pre-war and wartime tasks are identified and classified. A National Centre for Aerospace Data and a Unit at the Bulgarian Army are suggested to be established to enhance the preventive factor in national security.

Currently, the Bulgarian army does not have in its disposition data from remote sensing Artificial Earth Satellites (AES) – military or civil. However, there is some experience with the use of two communication satellite systems, including "Inmarsat", the global satellite navigation system "NAVSTAR" by the Aviation and the Navy; the satellite meteorological system "Metcosat" for the needs of the Air Force; as well as the station of the military-topographic service of the Bulgarian Army (BA) for monitoring of AES by the system "NAVSTAR".

In the Military Doctrine of the Republic of Bulgaria, the following text was incorporated envisaging the future use of the space segment in military affairs:

"In modernization of the armed forces, priority shall be given to the systems for command, control, observation, investigation, communication, mutual acquaintance, computerization, navigation, **including space systems, equipment, and technologies** providing for compatibility with the

armed forces of the NATO member-countries and transition to national information society.”

By Order No.9/19.01.1998 of the Head of the General Staff (GS) of the BA, a work group was instituted to assess the need of aerospace data for the BA. At the GS, the Ministry of Defence (MD), and the various types of armed forces, archive space images from civil (American, French, and Russian) satellites for remote sensing of the Earth from Space were shown with resolution of 30 to 2 meters.

This analysis revealed that the army needs a unit to acquire, process, analyze, and distribute the necessary space data among all users from the corps. This unit is an affiliate of the National Centre for Aerospace Data (NCAD), which is intended to serve all users in the country (Fig.1).

The major prospective military areas where space images could be implemented are the following (Fig.2):

- assisting decision-taking based on models and data bases;
- digital cartographing and Geographic Information Systems (GIS);
- digital modelling of terrain, simulation, and training equipment.

According to current information war theory currently, the **decision-taking** process is a cognitive one. It takes place at all levels of military hierarchy: strategic, operative, and tactic, through the data-decision-action cycle. The sufficient amount of available correct data at each of these levels provides for the normal course of the cognitive cycle. If image data from the arena of military activity (AMA) is sent by a satellite almost on-line and the opponent does not have such data, a data superiority is available from the viewpoint of data provision of the actions of the armed forces. The implementation of this approach provides for a more expedient data-decision-action cognitive cycle. Thus, the actions of the corps and forces will be more expedient, too, and hopefully, they will be used in the most rational way.

In this direction, the unit shall have to solve the following specific problems:

- a) with respect to the potential opponent
 - revealing, identification, and determination of the coordinates of military objects;
 - collecting data about the dislocation and composition of the Infantry, Air Forces, and Navy of the neighbouring countries;
 - controlling the observation of bilateral or multilateral military agreements on near-frontier zones;

- collecting data about the military-economic potential of the opponent;
 - control of AMA equipment;
 - collecting data about the accessibility and capacity of operative or technical directions;
 - early identification of preparatory activities for aggression;
 - monitoring of the progress of the troops of potential aggressors;
 - collection of operative-technical data for planning of military actions.
- b) with respect to one's own troops
- control and assessment of operative masking;
 - updating of cartographic data for the country's territory and the pertaining territories of the neighbouring countries;
 - preparation and timely communication of topogeodetic data to the troops for the purpose of study and assessment of the AMA;
 - integral coordinate-time provision of the forces and equipment of the BA;
 - preparation of initial data with a view to the effective use of armament and military equipment;
 - coordination of satellite communication systems;
 - coordination of AMA real-time meteorological data and weather forecast for a couple-of-days period;
 - providing for the search and rescue of crews, aircraft, ships, and people in calamitous situations;
 - collection of data about the locality's pollution, radioactive pollution including, caused by great industrial failures and assessing their effect on the troops grouping;
 - monitoring of the state of water catchments and assessing the risk of potential floods;
 - assessing the effect of peace-time activity of the BA's garrisons on regional ecosystems;
 - provision of the forces and equipment participating in humanitarian or peace-establishing operations.

If, however, the opponent has already gained data superiority, the effort may be aimed at its reduction.

The above-listed tasks may be also classified as peace-time tasks, tasks in a period of threat, and war-time tasks. Regardless of the used classification, their analysis reveals that the nature of these tasks is mostly informative. Their accomplishment assumes the solution of a complex of

technical, organizational, and financial problems, the timely preparation of dedicated military staff including.

Digital cartographing based on satellite images allows to make **digital maps** and to develop **geoinformation systems** referencing the individual activities, objects, and plans to geographic coordinates. Thus, various sections depending on the chosen symptom may be obtained providing invaluable data to military activity.

Digital terrain modelling allows to create data arrays for control of high-precision weapons, aviation, and unmanned aircraft. They can also be used to train crews by creating **virtual media** close to the real one thereby providing for the accomplishment of economical and highly effective **staff instruction and training**.

To implement these tasks in the strategic and operative units of the BA, three kinds of satellite data are needed: archive data, requested data, and current data.

Archive data is fundamental to assessment of the AMA, collection of additional cartographic data etc.

Requested data (up to several days) may be used to identify preparatory activities for potential aggression, to assess the masking of one's own troops, and to plan future battles.

Current data provides a nearly on-line assessment of the military-strategic circumstances in the region, including monitoring of the development of potential critical situations on the Balkans.

While the first two types of information can be provided for a compensation by distributing organizations, current data assumes the use of a ground-based station for receiving of images from remote sensing AES. In most countries, this equipment feed such data not to one institution, but to all concerned users related with economy, ecology, infrastructures, defence, and security. Albeit the current unfavourable economic circumstances, the Republic of Bulgaria can use data from various spacecraft with Bulgarian equipment on board.

Accounting for the expanding market of satellite data, for the purpose of this data's wholesome utilization for the needs of defence and other public activity areas, two approaches are possible:

- a) through distributing organizations – regular obtaining of archive and requested data;
- b) through construction of stations for data acquisition from remote sensing AES – obtaining of current data.

In Bulgaria, image data is distributed by the French firm "Spot Image", the Russian firm "Sovinformsputnik" and the Greek firm "Space

Imaging Europe" s.a. Professionals are also available who process these images by modern computer equipment, including by Silicon Graphics and Sun stations and develop GIS. This will be helpful in accomplishing both the first and the second version. To implement the second version for the needs of the country, a satellite data acquisition system should be bought which will supply images to the aerospace data unit of the MD as well. Suitable for the purpose are the mobile satellite data acquisition systems, which appeared recently on the market. They feature good enough characteristics and relatively low prices (about US\$500,000). An example of such station is the Dutch system "RAPIDS" (Figs.3.1, 3.2, 3.3). The diagram of the joint Bulgarian-Dutch experiment is shown in Fig.4.

Accounting for the achievements and traditions of our country in Space use, by Decree of the Council of Ministers (CM) No.462/12.12.1997, an Interinstitutional Committee on Space Studies (Fig.5) was established. It accounts for and implements the interests and suggestions of the institutions, organizations, and private companies, among which the MD occupies a central place. The choice of the proper version lies within the competence of the Interinstitutional Committee on Space Studies. The solution of this problem is indispensable in view of the fact that the Republic of Bulgaria is winning recognition as an infrastructural joint on the Balkans comprising transportation corridors, petrol-, gas- and electricity-conducting networks, and a host-state to the staff of the multinational corps in South-East Europe.

Depending on its capacity, the prospective NCAD will provide data not only to the military, state, and private institutions, but to the state's leadership as well – the Advisory Council on National Security at the President's Office and the Council at the CM. The foundation of the NCAD at the BA is an essential prerequisite for strengthening of the preventive factor of national security, which becomes of essential importance now that the quantitative-qualitative features of the armament, military equipment, and the BA as a whole have dropped.

References

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2. П е н е в П. Б., Спътниковата информация и борбата за информационно превъзходство, Военен журнал No. 6, 1998.

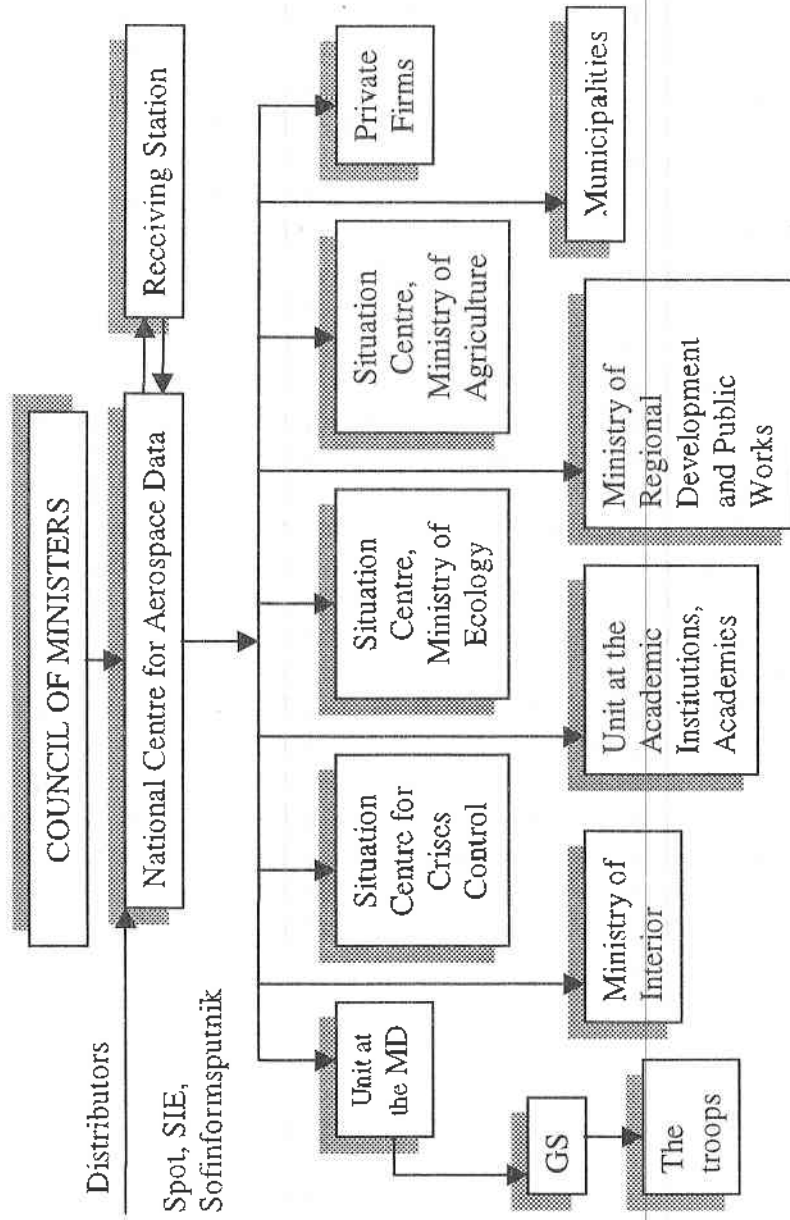


Fig.1

UTILIZATION OF AEROSPACE IMAGES

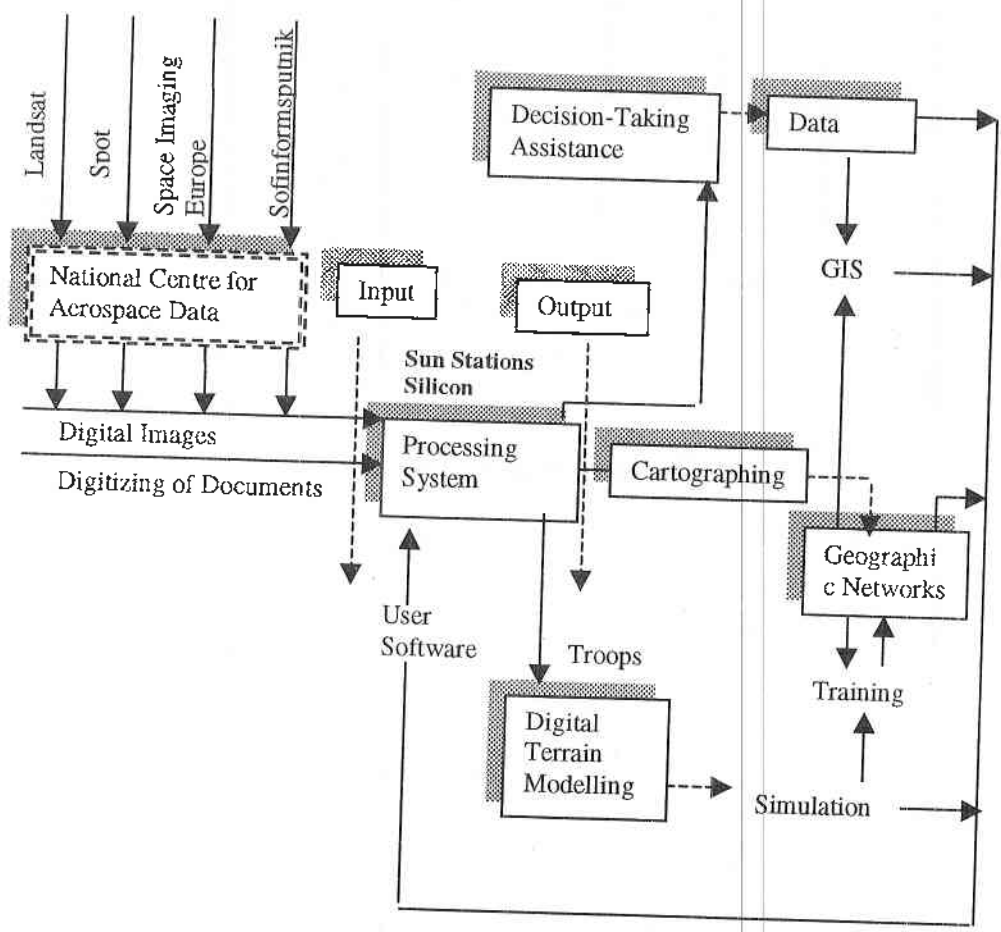


Fig. 2

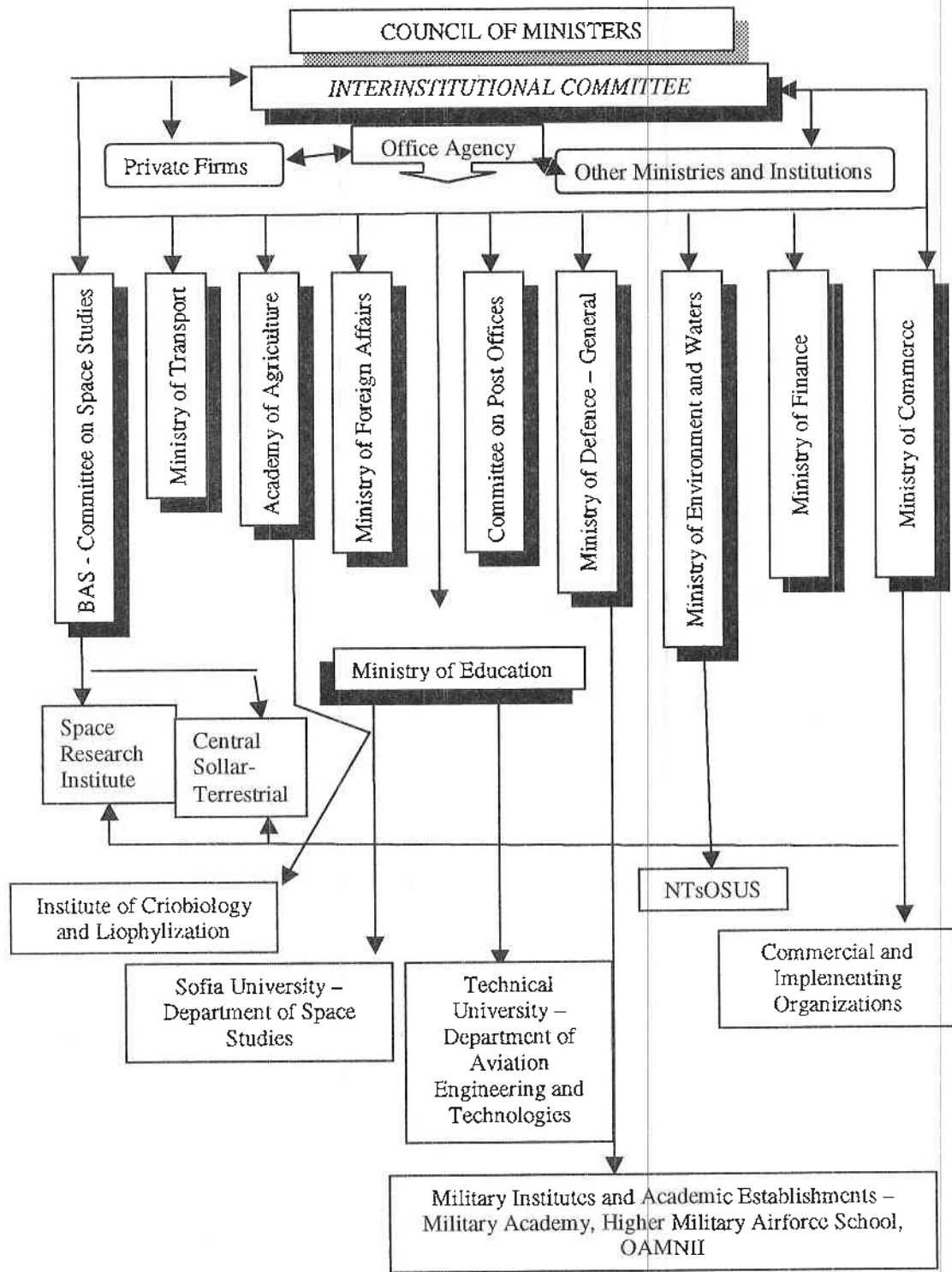


Fig. 5

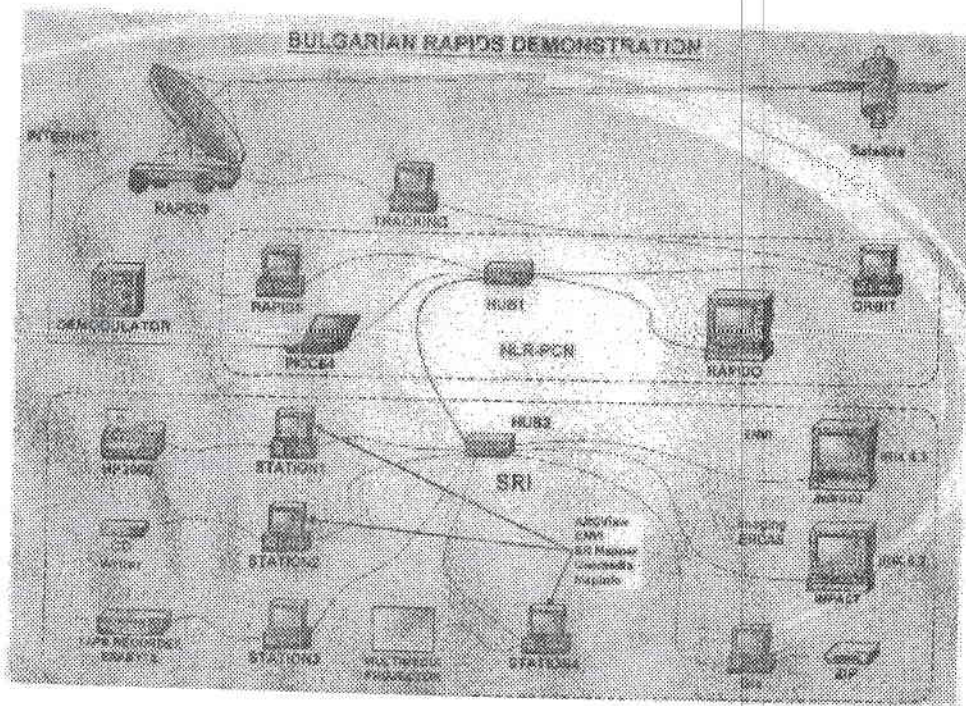


Fig.3.1

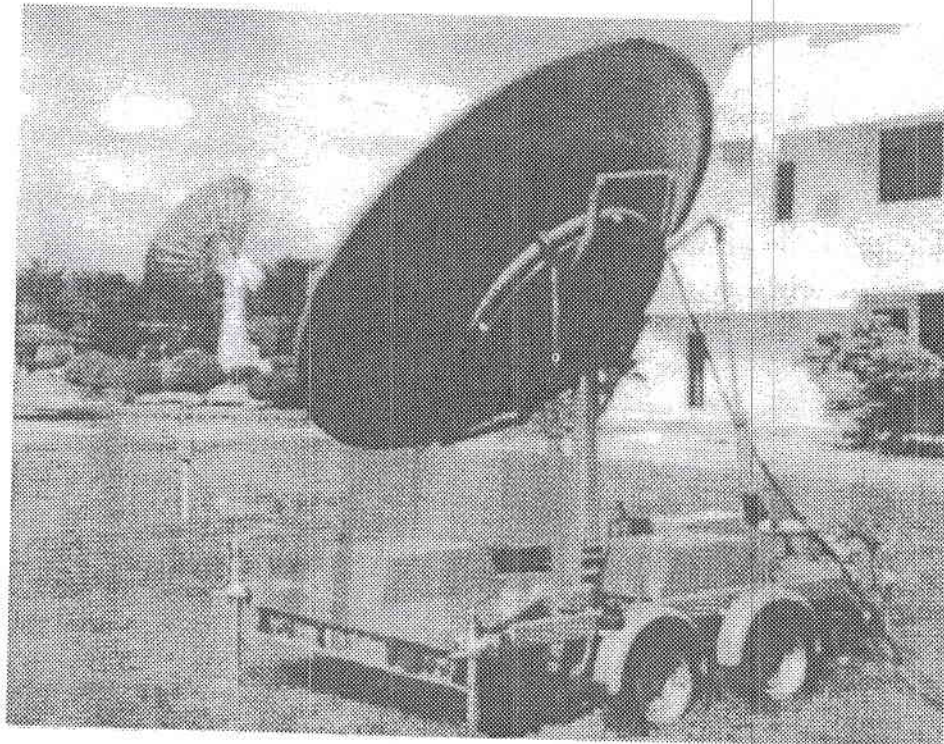
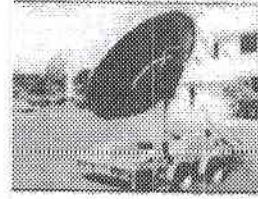


Fig.4

RAPIDS

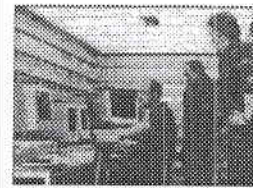
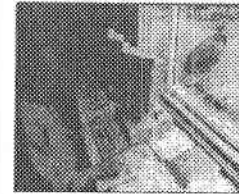
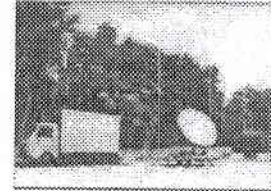
WHAT IS RAPIDS?

RAPIDS is a ground-based receiving station for receiving and processing of data from remote sensing satellites – ERS and SPOT



SYSTEM ADVANTAGES

- Optional autonomous receiving of local data
- within an area with radius of 1,000 km.
- Easy transportation and installation.
- Automatic monitoring of satellites, collection and processing of data.
- Processing and archiving of data from optic and radar sensors.
- Using standard PCs and software.
- Automatic check-in, easy maintenance,
- and prospects for development.
- Standard data source format compatible with various applications and technical equipment.
- Potential for system development with a view to receiving data from other satellites – LANDSAT, IRS, RADARSAT, EROS etc.
- Mission planning, education, training and simulation.



Joint project

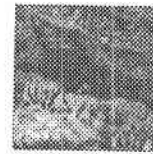
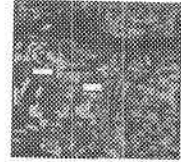
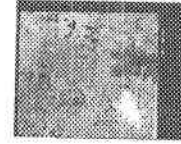
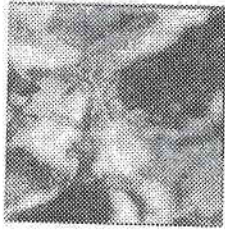
Organized by the Ministry of Defence of the Republic of Bulgaria
and the Kingdom of Netherlands

Fig.3.2

RAPIDS

POTENTIAL APPLICATIONS OF THE OBTAINED DATA

- Classification of the types of land cover for the purpose of updating the data from the project CORINE LANDCOVER.
- Mapping by using high-resolution data.
- Topical mapping and monitoring of forest massifs by optical and radar data combined with ground studies.
- Monitoring of natural disasters and failures. Effective identification of forest fires and floods, monitoring of their activity.
- Monitoring of areas with seismic activity.
- Working out of digital topographic maps.
- Obtaining of stereo images and deriving of digital models of the locality.
- 3D modelling for the purpose of terrain mapping and representing from various view angles and positions.
- Development of training complexes and simulation data bases.



Joint project

Organized by the Ministry of Defence of the Republic of Bulgaria
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Fig.3.3

РОЛЯТА НА АЕРОКОСМИЧЕСКИТЕ ТЕХНОЛОГИИ И НА ВОЕННИЯ ФАКТОР ЗА НАЦИОНАЛНАТА СИГУРНОСТ

Петър Гецов, Павел Пенев

Резюме

В доклада се разглежда съвременното състояние на използването на аерокосмическа информация в Българската армия. Дефинирани са основните възможни области на приложение на аерокосмическите изображения във военното дело. Посочени и класифицирани са задачите в мирно време, в застрашаващия период и във военно време. Предлага се да бъде създаден национален център за аерокосмическа информация и звено към БАН с цел засилване на превантивния фактор в националната сигурност.